

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of claims:

1.-5. (Canceled)

6. (Previously Presented) A coated metal reinforcement element for a polymeric or elastomeric material comprising: a metal reinforcement element having a metal surface; and a coating for the reinforcement element comprising a polymer deposited from a solution comprising a solvent selected from the group consisting of an aqueous solvent, alcoholic solvent and organic solvent and compatible with and co-polymerizable with said material to be reinforced, and bearing functional groups covalently bonded with the outward directed first functional groups of a mono-molecular layer of a bifunctional adhesion promoter intercalated between said metal and said coating and bound to said metal by its second functional groups.

7. (Currently Amended) A coated metal reinforcement element according to claim 6 ~~for a polymeric or elastomeric material comprising: a metal reinforcement element having a metal surface; and a coating for the reinforcement element comprising a polymer deposited from a solution comprising a solvent selected from the group consisting of an aqueous solvent, alcoholic solvent and organic solvent and compatible with and co-polymerizable with said material to be reinforced, and bearing functional groups covalently bonded with the outward directed first functional groups of a multi-molecular layer of a bifunctional adhesion promoter intercalated between said metal and said coating and bound to said metal by its second functional groups: wherein said layer of a bifunctional adhesion promoter is a mono-molecular layer.~~

8. (Currently Amended) A coated metal reinforcement element according to claim 4, wherein said coated metal reinforcement element is an elongated steel element.

9. (Previously Presented) A coated metal reinforcement element according to claim 8, wherein said elongated steel element is coated with one or more metallic layers comprising an alloy selected from the group consisting of brass, bronze, zinc, zinc alloy, tin and tin alloy.

10. (Original) A coated metal reinforcement element according to claim 9, wherein said zinc alloy is an alloy selected from the group consisting of a zinc-aluminium alloy, a zinc-aluminium-mischmetal alloy, a zinc-manganese alloy, a zinc-cobalt alloy, a zinc-nickel alloy, a zinc-iron alloy and a zinc-tin alloy.

11. (Canceled)

12. (Currently Amended) A coated metal reinforcement element according to claim 4, wherein the polymer of the coating comprises a polymer matrix selected from the group consisting of thermoplastics, thermoplastic elastomers, thermoplastic polyolefins, olefinic rubbers, polyurethanes, polyurethane blends, elastomeric polymers, elastomeric copolymers and at least partially elastomeric block copolymers.

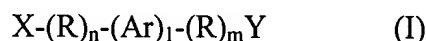
13.-14. (Canceled)

15. (Previously Presented) A coated metal reinforcement element according to claim 12, wherein the elastomeric block copolymer is selected from the group consisting of styrene butadiene rubber, butyl rubber, acrylonitrile butadiene rubber, ethylene propylene dien copolymer, ethylene propylene copolymer, natural rubber, synthetic poly(isoprene), chloroprene rubber, and a functionalized non-cured rubber composition.

16. (Previously Presented) A coated metal reinforcement element according to claim 15, wherein the non-cured rubber composition is selected from the group consisting of a synthetic poly(isoprene), a natural poly(isoprene), a synthetic poly(butadiene), and a natural poly(butadiene) and includes common vulcanization additives and curing materials.

17. (Currently Amended) A coated metal reinforcement element according to claim 4, wherein the functional group is selected from thiol groups; mercapto groups; silanes; amines; -SH; -SiHCl₂; -SiH₂Cl; -Si(Cl)₃; -SiHBr₂; -SiH₂Br; -SiBr₃; -Si(R'(Cl)₂); -Si(OR')₃; -Si(R'(OR')₂); -COOH; -COCl; -PO₃H₂; -SO₂H; their acid anhydride and their acid chloride groups; organometallic groups of the formula -M(OR')_n or -M(Cl)_n, whereby M is a metal selected from the group consisting of Al, Sn, B, Ti and V, n being the ligand number corresponding to the metal M; phthalocyanine or phthalonitrile groups; or monothiol or monothiolate groups, wherein R' is alkyl, methyl, ethyl or propyl ~~in case of a bonding directly to the metal surface~~; all these functional groups either as terminal groups or carried along the polymer backbone or as part of side chains, further including epoxy groups carried along the polymer backbone as well as being part of side chains attached to the polymer backbone (-CH₂-CH₂-COC (epoxy)-CH₃).

18. (Currently Amended) A coated metal reinforcement element according to claim 4, further including an adhesion promoter that is a bifunctional compound of the general formula (I)



with X representing a group capable of reacting covalently at the metal surface,

R representing an organic spacer chain,

Ar representing an aromatic and/or heteroaromatic system,

Y representing a group capable of forming covalent bonds to a group selected from polymer of the coating, and

$$0 \leq n, m \leq 16; 0 \leq 1 \leq 6.$$

19. (Currently Amended) A coated metal reinforcement element according to claim 18, wherein the general formula (I) is as follows:

X: -SH; -SiHCl₂; -SiH₂Cl; -Si(Cl)₃; -SiHBr₂; -SiH₂Br; -SiBr₃; -Si(R'(Cl)₂); -Si(OR')₃; -Si(R'(OR')₂); -COOH; -COCl; -PO₃H₂; -SO₂H; their acid anhydride and their acid chloride groups;

an organometallic group of the formula -M(OR')_n, whereby M is a metal selected from the group consisting of Al, Sn, B, Ti and V, n being the ligand number corresponding to the metal M;

a phthalocyanine or a phthalonitrile group; or

a monothiol group or a monothiolate group;

with R' being alkyl, ~~namely methyl, ethyl or propyl;~~

Y: NH₂; NHR'; NR'₂, or an unsaturated residue, having an unsaturated terminal double or triple carbon-carbon bond; an acrylic or methacrylic acid group and its methyl or ethyl esters;

-CN; an activated carboxylic ester; an aldehyde group; an epoxide group;

-SH; -SiHCl₂; -SiH₂Cl; -Si(Cl)₃; -SiHBr₂; -SiH₂Br; -SiBr₃; -Si(R'(Cl)₂); -Si(OR')₃; -Si(R'(OR')₂); -COOH; -COCl; or a functional group capable of forming a complex with at least one ingredient of a non-metallic medium;

R: -CH₂-; or a -(CH₂)_n- chain and whereby 2 ≤ n ≤ 20 and whereby said chain may be unhalogenated, partially halogenated or perhalogenated and may contain aromatic or thiophen units, and whereby the chain and/or the units may comprise substituents selected from the group consisting of:

-(CH₂)_iCH₃ with 0 ≤ i ≤ 5, -O(CH₂)_jCH₃; -O(CF₂)_jCH₃ with 0 ≤ j ≤ 4; -CN; -NH₂; -CF₂-; -CH₂-CO-NH-CH₂-; -CF₂-CO-NH-CF₂-; -CH₂-CO-NH-CF₂-; and CF₂-CO-NH-CH₂-;

AR_r: an aromatic and/or heteroaromatic system substituted for the substituents.

20. (Previously Presented) A coated metal reinforcement element according to claim 16, including a layer of a polymeric or non-cured elastomeric composition on top of said coating for further reinforcement, wherein said layer comprises polymers that could not be directly bound to the metal surface.

21. (Previously Presented) A coated metal reinforcement element according to claim 20, wherein the non-cured elastomeric composition of the additional layer is a vulcanizable rubber composition.

22. (Withdrawn) A method for coating a metal surface with an adhesion promoter, comprising the steps of

selecting an adhesion promoter which is an organosiloxan of the general formula (I)



wherein X is a siloxane group, a chlorosilane group or a bromosilane group selected from the group consisting of -SH; -SiHCl₂; -SiH₂Cl; -Si(Cl)₃; -SiHBr₂; -SiH₂Br; -SiBr₃; -Si(R'(Cl)₂); -Si(OR')₃; -Si(R'(OR')₂); -COOH; -COCl;

pretreating X before use by adding a definite amount of water under stirring at an elevated temperature, the amount being calculated to at least partially hydrolyze and to partially condense the siloxan;

preparing a solution of the adhesion promoter and diluting the solution with alcohol; and immediately after a certain ripening period applying the diluted solution to said metal surface, thereby forming a dense mono- or multimolecular layer on the metal surface.

23. (Withdrawn) A method according to claim 22, wherein the hydrolysis is catalyzed by hydrolyzed 3-amino-propyl-trimethoxysilane.

24. (Withdrawn) A method according to claim 22, wherein the hydrolysis is catalyzed by partially hydrolyzed 3-amino-propyl-trimethoxysilane.

25. (Withdrawn) A method according to claim 22, wherein the metal is selected from the group consisting of zinc or zinc alloy, tin or tin alloy, brass, bronze.

26. (Withdrawn) A method according to claim 22, wherein the metal is steel coated with one of the metals selected from the group consisting of zinc or zinc alloy, tin or tin alloy, brass, bronze.

27. (Withdrawn) A method according to claim 22, including pretreating the metal surface with iPrOH, iPrOH-H₂O, HCl_{aq}, carbonate, KOH, separately or in any combination.

28. (Withdrawn) A method for coating a metal surface, comprising the steps of:
depositing an adhesion promotor from an aqueous, alcoholic or organic solvent,
and
depositing a functionalized non-cured polymer or prepolymer from an aqueous, alcoholic, or organic solvent, or from the bulk material.

29. (Withdrawn) A method according to claim 28, wherein said depositing is carried out in a one step procedure.

30. (Withdrawn) The method according to claim 28, wherein the metal is selected from the group consisting of zinc or zinc alloy, tin or tin alloy, brass, or bronze.

31. (Withdrawn) The method according to claim 30, wherein the metal is steel coated with one of the metals selected from the group consisting of zinc or zinc alloy, tin or tin alloy, brass, or bronze.

32. (Withdrawn) The method according to claim 28, including the step of pretreating the metal with iPrOH, iPrOH-H₂O, HCl_{aq}, carbonate, KOH, separately or in any combination

33. (New) A coated metal reinforcement element according to claim 6, wherein said polymer is co-vulcanizable with said polymeric or elastomeric material to be reinforced.

34. (New) A coated metal reinforcement element according to claim 6, wherein said polymer is crosslinkable with said polymeric or elastomeric material to be reinforced.

35. (New) A coated metal reinforcement element according to claim 19, wherein said R', being an alkyl, is a methyl, ethyl or propyl.